Title: A Systematic Evidence Map Protocol of Time Activity Data in Exposure Science

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Abstract

Time Activity Data (TAD) describe the frequency, duration, and timing of human activities. Given that activity dictates the rate of contact a person has with an environmental hazard, activity data can be used to derive rigorous estimates of exposure. TAD have been used to support exposure estimation in a variety of contexts, though there has been no systematic characterization of the use of this approach in exposure science and environmental epidemiology. Here, we propose a protocol in pursuit of characterizing the body of peer-reviewed literature using TAD in the estimation of exposure to chemical, biological, and physical hazards in the form of an evidence map. This protocol details the proposed search strategy and plan for data extraction including study population demographics, methods of TAD collection, and study participant activities. Reflexive journaling, codebook development, and descriptive statistics will be conducted to analyze the data collected as part of this evidence map.

Key Words

Time Activity Data, Activity Diary, Microenvironment, Exposure Science, Systematic Evidence Map

Introduction

The proposed protocol aims to support the development of an evidence map that describes the body of literature involving the use of time activity data (TAD) in the estimation of exposure to environmental hazards. Human behavior and activities are not uniform across persons and lend themselves to different rates of contact with a hazard. Thus, assuming behavioral patterns at the population level may result in meaningful exposure misclassification. This misclassification can lead to a reduced ability to detect and understand the relationships between exposures and hazards when such associations exist. A more rigorous exposure estimation may be possible when combining TAD with quantitative measurements of environmental hazards. TAD comprise information about the frequency, duration, and timing of human activities. These data can support the precise, individual-level estimation of exposure to environmental hazards. In our systematic evidence map, we seek to document and characterize how TAD is used in exposure science, while examining how this usage varies across biological, chemical, and physical hazards.

Materials and Methods

Search Strategy

We will search the National Institutes of Health's PubMed and Elsevier's Scopus databases. PubMed was chosen for this review because it is considered a premier search engine for biomedical and health science research. Scopus was selected because of its broad coverage of non-biomedical literature, including the social sciences. The proposed search strategies for PubMed and Scopus are shown in Supplementary Methods I. No gray literature or trial registers will be considered as part of this review. The search will be conducted on or about September 15, 2023, and all papers published in 1980 or later will be eligible for review. A repeat search will be conducted in February 2024 to identify any additional studies worthy of inclusion published since the original search date.

Dataset Refinement

Once the search strategy is implemented, de-duplication of the resulting studies will be performed using the systematic review software Covidence. After de-duplication, two screeners will conduct this review to increase the number of potentially relevant studies identified and to minimize bias.

In Title/Abstract screening, we will assess each study's title and abstract to determine if the study appears to collect TAD and estimates an environmental exposure. Studies that do not fulfill these requirements will be excluded while the rest will undergo full-text screening. During full-text screening, studies adhering to the Population, Exposure, Comparator, and Outcome(s) (PECO) criteria will be retained while those that do not will be removed.

Given that the aim of this research is to provide an overview of the literature on TAD, the *Population* in this review will include all individuals in the general human population. Time activity data (TAD) will be treated as the *Exposure,* meaning that an included study must have collected TAD that can be used to estimate an environmental exposure. The third component of the PECO, *Comparator,* will be omitted since all studies collected will include TAD for the purpose of exposure estimation. The *Outcome* will be the estimation of exposure to environmental hazards modeled using TAD. Additionally, studies must be written in English and published in a peer-reviewed journal in order to be included.

If there is any disagreement between screeners on whether an article adheres to the established PECO criteria, they will engage in a discussion to determine if the article will be included in the final dataset. In the event that they cannot reach a consensus, another screener will review the article and help them reach a decision. The remaining studies will then be sorted into three categories based on the type of environmental hazard (chemical, biological, or physical), and if a paper does not address a specific environmental hazard, it will be placed into a separate category for papers that discuss methods of TAD collection.

Environmental hazards include chemical, biological, and physical agents which can harm human health. For the purpose of this research, a chemical hazard will be defined as a chemical agent that adversely impacts health through toxicological mechanisms. A biological hazard will be defined as an agent that causes infection or disease (note: studies of exposures to toxins produced by biological organisms will be considered biological hazards). Physical hazards will include non-chemical and non-biological agents such as extreme temperatures, radiation, noise, and light.

Data Extraction

Article information such as the article title; first author's name and primary affiliation; year of publication; journal name; funding source; and author-supplied keywords will be recorded. Next, it will be noted whether or not the study pertains to an occupational population. If the study is occupational, the

industry and company name (if available) will be extracted. If not, this field will be left blank. The type of environmental hazard studied in each article will be documented (e.g. biological, chemical, or physical). The specific hazard studied (e.g. *E. coli*, benzene, light) will be recorded separately. For biological and chemical studies, the medium/media of exposure and route(s) of exposure will also be documented.

Then, we will collect information on the study participants' demographics when available. We will note whether the population age, sex, or ethnic breakdown were provided in the study. Study population ages will be noted down as presented in the study and may be categorized into age-specific groups in the data synthesis step. If the study contains data on the population's sex, we will note the proportion of male study participants, female study participants, and intersex participants. If the study contains data on the population's ethnicities, we will record the proportion of each ethnic group represented in the study. The study size and the country in which the study took place will be extracted. If available, the state/province or city will also be noted.

We will also note how participants were recruited (e.g. random digit dialing, email chain, etc.) and a brief summary of their relationship to the study authors (e.g. personal network, general public, etc.). The method of TAD collection, the frequency of TAD collection, the duration over which TAD were collected, and the study length will be extracted from each study. The study length describes the time period over which the study was conducted (usually multiple months) while the duration refers to a subset of that time period in which TAD were collected. In some cases, the study length and duration may be the same. Both of these variables will be collected as text entries and will be standardized into codes during data synthesis.

Many studies that collect TAD also collect information on participant *microenvironment*, which is defined as the location where the exposure takes place that is characterized as having a homogeneous concentration of a hazard (Zartarian et al. 2005). Whether a study collects specific microenvironments and specifies what activities participants engaged in will be noted. If this information is collected, the specific microenvironments and activities will be listed. Finally, a key component of this research is to understand how exposure scientists operationalize TAD. Therefore, the specific terms used in the study to describe data that contain information on the timing, duration, and frequency of human activities will be listed (e.g. "time activity data," "time activity diary," "activity log," etc.). An example of the data extraction form can be found in Supplementary Methods II.

All data will be recorded and inputted into a table in Google Sheets. Two screeners will conduct both Title/Abstract and full-text screening. One person will extract data from biological hazard studies and one person will extract data from physical hazard studies. Both screeners will extract data from chemical hazard studies. Both screeners will also randomly select 10% of each other's biological or physical hazard studies to ensure consistent and reproducible extractions.

Data Synthesis

Codebook Creation

We have constructed a codebook *a priori* that will be used to categorize the extracted data.
As data is collected, the codebook will be updated iteratively by creating and assigning new codes for improved analysis. Each code in the codebook will have a specific, objective definition to ensure that the coding process is reproducible. In situations where it is unclear what code to assign to a study, the data will be noted as presented in the study, and definitions of existing codes will be revised or new codes will be created. Supplementary Methods III depicts an example of our codebook.

Reflexive Journaling

Reflexive journaling will be done weekly to document any themes or patterns observed in the data throughout the process of developing the codebook, identifying code choices, and noting unanswered questions. The iterative process of reflexive journaling can inform the creation of categories within the codebook, ensuring that the codebook is highly specific and represents the dataset well. Reflexive journaling allows scientists to reflect on their research approach; challenge their personal assumptions; and identify how their thoughts, actions, and decisions shape their perspectives (Saldaña, 2009). This process will ensure that the codebook remains dynamic as the data analysis progresses.

Statistical Analysis

Once we extract data from all articles in the review, we will count the number of articles that contain specific codes. We will then use Google Sheets to analyze these counts which can allow for descriptive statistics. Tables 1 and 2, respectively, depict the type of qualitative and quantitative data that will be recorded. We anticipate that most data will be qualitative with the exception of the following: duration of TAD collection in each study; proportions of sexes and ethnicities among study populations; year of

publication; the study population size; and the length of the study. Most qualitative data will be nominal such as the name of the chemical hazard studied, the microenvironments mentioned in the study, and the terms used to describe data that contain time and activity information.

We will use relative frequency distributions to help us identify themes and patterns within our data. For most data, measures of central tendency will include the mode or values that occur most frequently within a dataset (e.g. the most common physical hazard studied). Variability measures will likely be limited to the year of publication, the duration of data collection, and the study population size. For example, the range of studies published across all years of publication will be noted.

Table 1. Anticipated Qualitative Data.

Nominal		**Ordinal**
Dichotomous	**Polytomous**	

• If population __ is recorded (Y/N):
  ○ Age
  ○ Sex
  ○ Ethnicity
• If the study __ (Y/N):
  ○ Has an occupational population
  ○ Specifies participant microenvironments
  ○ Specifies participants' activities
	• Article title
	• First author name and affiliation type
	• Journal of publication
	• Name & type of funding source
	• Keywords provided by journal
	• Industry (for occupational studies)
	• Type of environmental hazard
	• Name of biological/chemical/physical hazard
	• Media of exposure
	• Route of exposure
	• Method of recruitment
	• Author relationship to recruited participants
	• Country, state/province/city of study origin
	• Method of TAD collection
	• Microenvironments
	• Activities
	• TAD terms used in study
		• Frequency of TAD collection

Table 2. Anticipated Quantitative Data.

Continuous	Discrete
● Duration of TAD collection ● Proportions of __ within study populations: ○ Sexes ○ Ethnicities	● Publication year ● Study population size ● Length of study

Discussion

This protocol is the foundation for an evidence map of how TAD have been used to estimate exposure to chemical, biological, and physical hazards. Anticipated challenges of this work include a potentially limited search strategy that does not capture the full range of studies using TAD given that there is no universally accepted term or definition for this type of data. Data analysis may also prove difficult since there are no established practices for collecting TAD. The method of TAD collection will vary between studies, which may make the coding process challenging.

Outside of exposure science, information that contains the timing, duration, and frequency of human activity has also been collected in the field of economics to estimate worker productivity. However, these studies will not be included in this systematic assessment since the data collected is not used to estimate exposure to environmental hazards. No studies outside of the field of environmental health science will be included in this review.

Abbreviations

N: no
PECO: population, exposure, comparator, and outcome(s) criteria
TAD: time activity data
Y: yes

Dictionary

Activity - the actions carried out by humans

Biological hazards - hazards that cause harm to human health by causing infection or disease; include toxins, bacteria, viruses, parasites, prions, and fungi.

Chemical hazards - substances that adversely impact health through toxicological mechanisms

Environmental hazards - natural or man-made hazards that cause adverse health events. Broken up into three categories: biological hazards, chemical hazards, and physical hazards.

Microenvironment - the location where the exposure takes place that is characterized as having a homogenous concentration of a hazard (Zartarian et al., 2005).

Physical hazards - non-chemical and non-biological agents that create harmful conditions for human health including extreme temperatures, radiation, noise, and light.

Risk - characterized based on the dose of a hazard, the magnitude of exposure to the hazard, and what health outcomes can result from the exposure (US EPA, 2013)

Time activity data - data that includes information on human activities and the frequency, duration, and timing of when these activities occur

CRediT Statement

Elizabeth Chatpar: Methodology, Writing - Original Draft, Writing - Review & Editing, Visualization. **Iman Habib:** Methodology, Writing - Original Draft, Writing - Review & Editing, Visualization. **Keeve Nachman:** Conceptualization, Methodology, Writing - Review & Editing, Supervision, Project Administration, Funding Acquisition. **Sara Lupolt:** Conceptualization, Methodology, Writing - Review & Editing, Supervision, Project Administration, Funding Acquisition.

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Declaration of Interests

The authors do not declare any conflicts of interest in regard to the authorship, research, and/or publication of this protocol.

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Supplementary Information

Supplementary Methods I

Proposed Search Strategy for PubMed

(("activity budget*"[tw] OR "activity diar*"[tw] OR "activity pattern*"[tw] OR "activity log*"[tw] OR "microactivity data"[tw] OR "microenvironment activit*"[tw] OR "microenvironmental activit*"[tw] OR "microenvironment model*"[tw] OR "microenvironmental model*"[tw] OR "microlevel activity time series"[tw] OR "time activit*"[tw] OR “task activit*”[tw] OR “activity categor*”[tw] OR “indoor activit*”[tw] OR “outdoor activit*”[tw] OR “daily activit*”[tw] OR “leisure activit*”[tw] OR “target activit*”[tw] OR “targeted activit*”[tw] OR “activity factor*”[tw])

AND ("Environmental Exposure"[Mesh] OR “expos*”[tw] OR “transmi*”)

AND ("Time"[Mesh:NoExp] OR “time*”[tw] OR “duration*” OR “frequenc*” OR “season*”[tw]))

Results: 3,232 articles

Proposed Search Strategy for Scopus

TITLE-ABS-KEY (("activity budget*" OR "activity diar*" OR "activity pattern*" OR "activity log*" OR "microactivity data" OR "microenvironment activit*" OR "microenvironmental activit*" OR "microenvironment model*" OR "microenvironmental model*" OR "microlevel activity time series" OR "time activit*" OR "task activit*" OR "activity categor*" OR "indoor activit*" OR "outdoor activit*" OR "daily activit*" OR "leisure activit*" OR "target activit*" OR "targeted activit*") AND ("expos*" OR "transmi*") AND ("time*" OR "duration*" OR "frequenc*" OR "season*")) AND NOT INDEX (medline)

Results: 2,148 articles

Supplementary Methods II: Data Extraction Form

Explanation of abbreviations are listed under “Abbreviations”.

General Article Information
Article title:
First author:
First author’s primary affiliation:
Year of publication:
Journal:
Funding source:
Keywords:
Occupational study (Y/N): If Y, industry:

Hazard Information
Study type:
If biological: Biological hazard type: Specific biological hazard: Medium of exposure: Route of exposure:
If chemical: Chemical name: Medium of exposure: Route of exposure:
If physical: Physical hazard name:

Population Demographics
Includes population age demographics? (Y/N):
Includes population sex demographics? (Y/N): If yes, P(M): P(F): P(I):
Includes population ethnicity demographics? (Y/N): If yes, P(AA): P(AS): P(HL): P(NA): P(PI): P(WH):

Study Design
Study size:
Country in which study takes place: State/Province/City (if available):
Recruitment strategy:
Relationship of authors to recruited participants:
Study length:

Methods
Method of TAD collection:
Duration of TAD collection:
Frequency of TAD collection:

Supplementary Methods II: Data Extraction Form (continued)

TAD Information
Includes information on participant microenvironments? (Y/N): If yes, list all microenvironments included in the study:
Includes information on participant activity? (Y/N): If yes, list all activities included in the study:
Terms used to describe TAD:

Supplementary Methods III

Table S1. Code Breakdown

<table>
<tr><th>Data Category</th><th>Data Collected</th></tr>
<tr><td>Article Information</td><td>The first author’s primary affiliation type will be categorized according to the list below. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>First Author Affiliation Type</th><th>Code</th></tr>
<tr><td>Government</td><td>GOV</td></tr>
<tr><td>Academic</td><td>ACA</td></tr>
<tr><td>Private foundation</td><td>FOU</td></tr>
<tr><td>Industry</td><td>IND</td></tr>
</table>

The funding source will also be categorized, according to the list below. If multiple sources fund the study, all sources will be categorized and listed. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>Funding Source Type</th><th>Code</th></tr>
<tr><td>Government</td><td>GOV</td></tr>
<tr><td>Academic</td><td>ACA</td></tr>
<tr><td>Private foundation</td><td>FOU</td></tr>
<tr><td>Industry</td><td>IND</td></tr>
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</td></tr>
</table>

<table>
<tr>
<td>Study Type</td>
<td>
Studies will be coded based on whether an occupational exposure is being measured.
<table>
<tr><th>Y/N</th><th>Code</th></tr>
<tr><td>Yes
Study participants were all part of the same workplace (e.g. healthcare workers).</td><td>Y</td></tr>
<tr><td>No
Study participants were not classified according to workplace (e.g. participants living in a specific zip code).</td><td>N</td></tr>
</table>
Studies will be characterized based on the type of environmental hazard measured.
<table>
<tr><th>Hazard Type</th><th>Code</th></tr>
<tr><td>Biological Hazard
Agents that cause harm to human health by causing infection or disease; include toxins, bacteria, viruses, parasites, prions, and fungi.
Proceed to Letter A for additional data collected.</td><td>BIO</td></tr>
<tr><td>Chemical Hazard
Substances that adversely impact health through toxicological mechanisms.
Proceed to Letter B for additional data collected.</td><td>CHE</td></tr>
</table>
</td>
</tr>
</table>

	<table><tr><td>Physical Hazard *Non-chemical and non-biological agents that create harmful conditions for human health including extreme temperatures, radiation, noise, and light.* Proceed to Letter C for additional data collected.</td><td>PHY</td></tr><tr><td>Methods *The study contains information on TAD in general but does not estimate exposure to a specific hazard*</td><td>MET</td></tr></table>
A. Hazard Specifics - Biological	Each biological hazard study will be characterized according to its category and will be assigned the appropriate code. <table><tr><th>Biological Hazard Category</th><th>Code</th></tr><tr><td>Bacteria</td><td>BA</td></tr><tr><td>Fungi</td><td>FN</td></tr><tr><td>Parasites</td><td>PA</td></tr><tr><td>Prions</td><td>PR</td></tr><tr><td>Toxins</td><td>TX</td></tr><tr><td>Viruses</td><td>VI</td></tr></table> The study will also be coded according to the medium of biological exposure studied. If participants are exposed through multiple media, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr>
<td></td>
<td>
<table>
<tr><th>Medium</th><th>Code</th></tr>
<tr><td>Air</td><td>A</td></tr>
<tr><td>Dust</td><td>D</td></tr>
<tr><td>Food</td><td>F</td></tr>
<tr><td>Soil</td><td>S</td></tr>
<tr><td>Water</td><td>W</td></tr>
<tr><td>Not Specified</td><td>NS</td></tr>
</table>

Finally, the study will be coded according to the biological route of exposure studied. If participants are exposed through multiple routes, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>Route</th><th>Code</th></tr>
<tr><td>Dermal</td><td>DE</td></tr>
<tr><td>Ingestion</td><td>IG</td></tr>
<tr><td>Inhalation</td><td>IH</td></tr>
<tr><td>Not Specified</td><td>NS</td></tr>
</table>
</td>
</tr>
<tr>
<td>B. Hazard Specifics - Chemical</td>
<td>
The study will be coded according to the medium of chemical exposure studied. If participants are exposed through multiple media, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>Medium</th><th>Code</th></tr>
<tr><td>Air</td><td>A</td></tr>
</table>
</td>
</tr>
</table>

	<table><tr><td>Dust</td><td>D</td></tr><tr><td>Food</td><td>F</td></tr><tr><td>Soil</td><td>S</td></tr><tr><td>Water</td><td>W</td></tr><tr><td>Not specified</td><td>NS</td></tr></table> The study will be coded according to the chemical route of exposure studied. If participants are exposed through multiple routes, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below. <table><tr><th>Route</th><th>Code</th></tr><tr><td>Dermal</td><td>DE</td></tr><tr><td>Ingestion</td><td>IG</td></tr><tr><td>Inhalation</td><td>IH</td></tr><tr><td>Not Specified</td><td>NS</td></tr></table>
C. Hazard Specifics - Physical	<table><tr><th>Hazard</th><th>Code</th></tr><tr><td>Extreme heat *Temperatures that can cause adverse health effects such as heat stress or heat stroke (typically above 90℉) (What Is Extreme Heat?, n.d.).*</td><td>XH</td></tr></table>

<table>
<tr>
<td></td>
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<table>
<tr><td>Extreme cold
Temperatures that can cause adverse health effects such as frostbite or hypothermia (typically below 32℉) ((National Weather Service, 2022).</td><td>XC</td></tr>
<tr><td>Ionizing radiation
Radiation that removes electrons from atoms or molecules (CDC, 2021).</td><td>IR</td></tr>
<tr><td>Non-ionizing radiation
Radiation that does not remove electrons from atoms or molecules (CDC, 2019a).</td><td>NI</td></tr>
<tr><td>Light
Any study that assesses artificial lighting as an exposure.</td><td>LI</td></tr>
<tr><td>Noise
Persistent sound that exceeds 70 decibels over a 24-hour period or 85 decibels over a 1-hour period (CDC, 2019b).</td><td>NO</td></tr>
</table>

Routes and media will not be recorded for physical hazards.
</td>
</tr>
<tr>
<td>Population Demographics</td>
<td>Studies will be coded based on whether or not they provide information regarding the study population’s age breakdown.

<table>
<tr><th>Y/N</th><th>Code</th></tr>
<tr><td>Yes
Study includes data on study population’s age</td><td>Y</td></tr>
</table>
</td>
</tr>
</table>

	<table><tr><td>No *Study does not include data on study population's age*</td><td>N</td></tr></table> Studies will be coded based on whether or not they provide information regarding the study population's sex breakdown. <table><tr><th>Y/N</th><th>Code</th></tr><tr><td>Yes *Study includes data on study population's sex*</td><td>Y</td></tr><tr><td>No *Study does not include data on study population's sex*</td><td>N</td></tr></table> Studies will be coded based on whether or not they provide information regarding the study population's ethnic breakdown. <table><tr><th>Y/N</th><th>Code</th></tr><tr><td>Yes *Study includes data on study population's ethnicity*</td><td>Y</td></tr><tr><td>No *Study does not include data on study population's ethnicity*</td><td>N</td></tr></table>
Recruitment Strategy *The method used to recruit study participants*	If multiple methods of recruitment are used, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
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<table>
<tr><th>Method of Recruitment</th><th>Code</th></tr>
<tr><td>Participants recruited via email</td><td>EMA</td></tr>
<tr><td>Participants recruited via phone (not random digit dialing)</td><td>PHN</td></tr>
<tr><td>Participants recruited via random digit dialing</td><td>RDD</td></tr>
<tr><td>Not specified by study</td><td>NS</td></tr>
</table>

The following codes will be used to describe the relationship between the study authors and the study participants. If multiple types of participants are recruited, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>Participants</th><th>Code</th></tr>
<tr><td>Personal network (e.g. the study author personally recruits people they know such as colleagues, friends, or family, etc.)</td><td>NET</td></tr>
<tr><td>Via an institution (e.g. the study author recruits individuals from a specific institution such as a university, school, etc.)</td><td>INS</td></tr>
<tr><td>General public (e.g. the study authors recruit individuals that live in a certain county)</td><td>PUB</td></tr>
<tr><td>Not specified by study</td><td>NS</td></tr>
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<tr>
<td>Methods of TAD Collection</td>
<td>For each study, the methods of TAD collection will be noted. If multiple methods</td>
</tr>
</table>

<table>
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<td></td>
<td>of collection are used, multiple codes will be recorded, each separated by a comma. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>Method(s) of Collection</th><th>Code</th></tr>
<tr><td>Activity Diary
Data were obtained from participants' individual diaries detailing personal activities</td><td>DIA</td></tr>
<tr><td>Interview
Data were collected from participants through in-person or on-the-phone questioning about daily time activities.</td><td>INT</td></tr>
<tr><td>Observation
Data were collected by observing study participants' activities.</td><td>OBS</td></tr>
<tr><td>Survey/ Questionnaire
Data were collected by issuing surveys or questionnaires that asked about individual activities.</td><td>SQU</td></tr>
<tr><td>Videography
Data were collected by noting down activities from videos of participants' daily activities.</td><td>VID</td></tr>
</table>
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<tr>
<td>Frequency of TAD Collection</td>
<td>Studies will be coded based on how frequently TAD was collected. A new code will be created and assigned to a study if it cannot be categorized with the existing codes below.

<table>
<tr><th>Frequency</th><th>Code</th></tr>
<tr><td>Constantly
Data collected at all times (e.g. data collected from a personal cellular device)</td><td>CON</td></tr>
<tr><td>Minutely</td><td>MIN</td></tr>
</table>
</td>
</tr>
</table>

	<table><tr><td>*Data collected every minute (e.g. a computer detects the frequencies of hand-to-mouth actions from video)*</td><td></td></tr><tr><td>Hourly *Data collected on an hourly basis (e.g. a phone survey is sent to a study participant every hour)*</td><td>HOU</td></tr><tr><td>Daily *Data is collected every day (e.g. participants complete a time activity diary at the end of the day)*</td><td>DAY</td></tr><tr><td>Weekly *Data is collected every week. (e.g. participants are interviewed once a week about their activities)*</td><td>WEE</td></tr></table>
Microenvironment *The location where the exposure takes place that is characterized as having a homogenous concentration of a hazard (Zartarian et al., 2005).*	Studies will be coded on whether they collected microenvironmental information or not. <table><tr><th>Y/N</th><th>Code</th></tr><tr><td>Yes *Study includes information on microenvironment*</td><td>Y</td></tr><tr><td>No *Study does not include information on microenvironment*</td><td>N</td></tr></table> If microenvironments are studied, the specific microenvironments will be noted. For studies that include multiple microenvironments, all codes will be included, each separated by a comma. A new code will be created and assigned to a study

<table>
<tr><td></td><td>if it cannot be categorized with the existing codes below.

<table><tr><th>Microenvironment</th><th>Code</th></tr><tr><td>Kitchen</td><td>KIT</td></tr><tr><td>Bedroom</td><td>BED</td></tr><tr><td>Bathroom</td><td>BAT</td></tr><tr><td>Living space (not bedroom)</td><td>LIV</td></tr><tr><td>Outdoors away from home</td><td>AWA</td></tr><tr><td>Outdoors at home</td><td>OUT</td></tr><tr><td>Hospital</td><td>HOS</td></tr></table></td></tr>
<tr><td>Activities</td><td>Studies will be coded on whether they collected information on specific activities participants engaged in.

<table><tr><th>Y/N</th><th>Code</th></tr><tr><td>Yes
Study includes information on participant activity</td><td>Y</td></tr><tr><td>No
Study does not include information on participant activity</td><td>N</td></tr></table>
Each novel activity will be given a 4-letter code. For studies that collect data on multiple activities, codes for each activity will be recorded and separated by commas. An example activity entry is presented below.</td></tr>
</table>

	<table><tr><th>Activity</th><th>Code</th></tr><tr><td>Farming *Cultivation or production of food crops or other agricultural products (Lupolt et al., 2023)*</td><td>FARM</td></tr></table>